γ event anisotropy at RHIC

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The first results on charged hadron event anisotropy in $\sqrt{s_{NN}}$=130 GeV Au+Au collisions at RHIC were presented by the STAR experiment[1]. Additionally, anisotropies from identified hadrons ($\pi^\pm$, $K^\pm$, p, and $\bar{p}$) have been presented in Ref.[2]. A question raised here is whether the event anisotropy for π^0 is the same as for charged pions. The measurement of γ is necessary to measure π^0 momenta since π^0 to 2γ is the dominant decay mode. Here we would like to report progress in measuring v_2 for γ rays as a first step of measurement of π^0 v_2.

We have established a method of gamma detection in the STAR experiment using the time projection chamber (TPC) to reconstruct electron positron pairs from photon conversions [3]. This method has the advantages that the momentum range (p_T>100 MeV) is wider and the energy resolution is better than typically the case for Electro-Magnetic Calorimeters (EMC). At the same time, the efficiency is quite low due to the small probability of gamma conversion (≈1%). These characteristics constrain our capability for gamma and π^0 physics at low p_T.

Since the statistics of our data are limited, we have started to analyze v_2 for gammas as a first step to measuring this quantity for π^0s. Figure. 1 shows gamma v_2 as a function of transverse momentum. The v_2 increases until about 2 GeV/c and then saturates. This feature is markedly similar to the charged hadron measurements[4]. Note that we need to take care of two corrections before we can extract the v_2 of π^0 from the gamma measurement; (1) Contributions from other gamma sources, e.g. direct gamma emission and hadron decays. (2) Kinematical effects which relate the gamma and π^0 v_2 measurements.
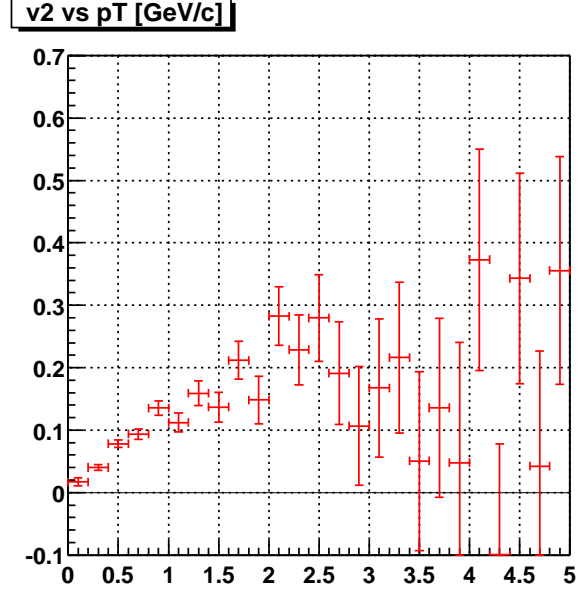

Figure 1: *STAR preliminary gamma v_2 parameter (vertical) as a function of transverse momentum (p_T) (horizontal), where v_2 is second harmonic of azimuthal particle distribution. The error of v_2 is statistical error only.*

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References

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